Prevalence and Predictors of Behavioral Problems in Healthy Swiss Preschool Children Over a One Year Period

Stülb, Kerstin ; Messerli-Bürgy, Nadine ; Kakebeeke, Tanja H ; Arhab, Amar ; Zysset, Annina E ; Leeger-Aschmann, Claudia S ; Schmutz, Einat A ; Meyer, Andrea H ; Kriemler, Susi ; Jenni, Oskar G ; Puder, Jardena J ; Munsch, Simone

Abstract: Behavioral problems impair children's health but prevalence rates are scarce and persistence rates vary due to divergence in age ranges, assessment methods and varying environmental factors. The aim of this study was to assess prevalence rates of behavioral problems, their persistence over a 1-year period, and the impact of child- and parent-related factors on behavioral problems. 555 2-6-year-old healthy preschool children were assessed at baseline and 382 of the initial sample at 1-year follow-up. Assessment included questionnaires concerning behavioral problems and their potential predictors (e.g. socio-economic status or parenting style). Altogether, nearly 7% of these children showed clinically relevant behavioral problems, and 3% showed persistent symptoms. Low SES, inconsistent parenting and corporal punishment were positively associated with behavioral problems. The prevalence rates of behavioral problems in Swiss preschoolers are similar to other European countries, but persistence is still rather low within preschool age. These findings need further confirmation in longitudinal studies.

DOI: https://doi.org/10.1007/s10578-018-0849-x

Prevalence and predictors of behavioral problems in healthy Swiss preschool children over a year's period

Kerstin Stülb[1], Nadine Messerli-Bürgy[1,2,3], Tanja H. Kakebeeke[4,5], Amar Arhab[3], Annina E. Zysset[4], Claudia S. Leeger-Aschmann[6], Einat A. Schmutz[6], Andrea H Meyer[1,7], Susi Kriemler[6*], Oskar G. Jenni[4,5*], Jardena J. Puder[3*], Simone Munsch[1§*]

[1]Department of Clinical Psychology and Psychotherapy, University of Fribourg, Rue P.A. de Faucigny 2, 1700 Fribourg, Switzerland
[2]Department of Psychology - Clinical Child Psychology and Biological Psychology, University of Fribourg, Rue P.A. de Faucigny 2, 1700 Fribourg, Switzerland
[3] Obstetric service, Lausanne University Hospital, Ave de Sallaz 82, 1011 Lausanne, Switzerland
[4] Child Development Center, University Children's Hospital Zurich, Steinwiesstrasse 75, 8032 Zurich, Switzerland
[5] Children's Research Center, University Children's Hospital Zurich, Steinwiesstrasse 75, 8032 Zurich, Switzerland
[6] Epidemiology, Biostatistics and Prevention Institute, University of Zurich, Hirschengraben 84, 8001 Zurich, Switzerland
[7] Department for Psychology, University of Basel, Missionsstrasse 62A, 4055 Basel, Switzerland

[§]Corresponding author
*shared last authors

Corresponding author:
Prof. Dr. Simone Munsch
Phone: 0041 26 300 76 57
Fax: 0041 26 300 97 12

Email addresses:
NMB: nadine.messerli@unifr.ch, THK: tanja.kakebeeke@kispi.uzh.ch AA: amar.arhab@unil.ch, CSLA: claudia.leeger@uzh.ch, KS: kerstin.stuelb@unifr.ch, AEZ: annina.zysset@kispi.uzh.ch, EAS: einat.schmutz@uzh.ch, SK: susi.kriemlerwiget@uzh.ch, OGJ: oskar.jenni@kispi.uzh.ch, SM: simone.munsch@unifr.ch, JJP: jardena.puder@chuv.ch

Journal: Child Psychiatry & Human Development

Running head: prevalence, predictors of behavioral problems in Swiss preschool children

Abstract (max. 150 words, now 148)

Behavioral problems impair children's health but prevalence rates are scarce and persistence rates vary due to divergence in age ranges, assessment methods and varying environmental factors. The aim of this study was to assess prevalence rates of behavioral problems, their persistence over a one-year period, and the impact of child- and parent-related factors on behavioral problems. 555 2–6-year-old healthy preschool children were assessed at baseline and 382 of the initial sample at one-year follow-up. Assessment included questionnaires concerning behavioral problems and their potential predictors (e.g. socio-economic status or parenting style). Altogether, nearly 7% of these children showed clinically relevant behavioral problems, and 3% showed persistent symptoms. Low SES, inconsistent parenting and corporal punishment were positively associated with behavioral problems. The prevalence rates of behavioral problems in Swiss preschoolers are similar to other European countries, but persistence is still rather low within preschool age. These findings need further confirmation in longitudinal studies.

Keywords: SPLASHY, child, behavioral problems, prevalence, predictors

Introduction

Behavioral problems are mental health problems that occur in up to every 4th child at preschool age [1] and include emotional problems, conduct problems, peer problems and hyperactivity problems. There is some evidence that prevalence rates of behavioral problems persist over the period of preschool age [2] into adolescence [3, 4, 5] and predict mental health disorders in adulthood unless treated [6]. These enduring behavioral problems have long-lasting effects on social integration and education [5, 7].

In this context Briggs-Gowan and colleagues [8] observed continued presence of behavioral problems in 49.9% of children aged 1-4 years at baseline during a two-year measurement period in a US birth record study. Bayer and colleagues [2] found that internalizing symptoms in children at preschool age of 4 years were predictive of internalizing symptoms at the age of 7 years. In another study with a longer assessment period over six years, 40.7% of the 3–17 years old children showed persistent prevalence rates of clinically relevant behavioral problems [9]. There is further evidence that emotional problems at preschool age (2-4 years) increase the risk for a corresponding diagnosis of anxiety and depressive disorder by a factor of 2–5 during the subsequent 8–9 years of childhood in a Danish birth cohort and a Dutch study from the general population [10, 11].

Nevertheless, current data on behavioral problems in early childhood reveal inconsistent prevalence rates, probably due to divergent assessment methods and age ranges. According to a review by Egger and Angold [1] who integrated four studies on preschoolers using different assessment techniques, prevalence rates of behavioral problems in children aged 2–5 years ranged from 14 to 26.4%. Lower, but still varying proportions of 4.8–17% were reported in European studies when the same assessment tool was applied (the Strengths and Difficulties Questionnaire, SDQ) [12], thereby facilitating direct comparisons of the surveys' prevalence rates at preschool age [13, 14, 15, 16]. Consequently, the findings of these studies cannot simply

be transferred to other countries within or beyond Europe. Such is the case for Switzerland, where so far data on preschoolers' mental health are missing. Only one earlier epidemiological study in the nineties investigated prevalence rates of mental disorders, but in older children. Steinhausen and colleagues [17] examined children at school age (7–16 years) using standardized diagnostic interviews and found prevalence rates of mental disorders of 22.5%. However, prevalence rates for children at preschool age are non-existent and the definition of persistence of behavioral problems is unsolved, as prior studies often do not provide information about cut-points of clinical relevance being used and further do not specify whether prevalence rates are consistent across two different measurement time points. Therefore, it remains unclear to what extent clinically relevant behavioral problems are persistent within the preschool age or whether large temporal fluctuation can be expected.

Screening of behavioral problems at preschool age is usually accomplished through parent-based assessment. The SDQ represents one of the gold standard measures allowing long-term monitoring of the prevalence rates of behavioral problems, as age-adapted assessment types are available. Numerous studies have underlined the reliability of the SDQ and its adequate psychometric properties in large samples of European children aged 4–7 years [18, 19]. It is worth noting that research from Goodman [12] and Gustafsson, Proczkowska-Björklund & Gustafsson [14] suggested not to adopt criteria from other countries when investigating the prevalence of behavioral problems, but to establish country-specific norms by calculating cut-off values using the 90^{th}-percentile approach in respective healthy community populations.

Besides the lack of prevalence data for Swiss children and the scarce knowledge about the persistence or fluctuation of behavioral problems within preschool age period, factors influencing behavioral problems of children at this early age need to be better understood in order to develop and implement preventive interventions. There is evidence that environmental factors such as low familial socio-economic status (SES; e.g., measured by income, educational

status and/or job level) [20] influence the occurrence of parent- and self-reported behavioral problems in children [9, 21, 22, 23]. Previous studies reveal odds ratios between 1.5 and 4.7 for the risk of behavioral problems in 4–5 and 3–17-year-old children living in low SES rather than high SES families (e.g. calculated by income, educational status and job level) [9, 24], probably due to increased perceived parental stress and negative parenting [25]. Furthermore, socio-cultural factors such as neighborhood and school environment were related to behavioral problems in 5–13-year-old American children [26]. In addition, living in a rural environment was related to higher prevalence rates of behavioral problems in low-income Swiss families [17], while studies from the US and Sweden have shown the opposite with higher prevalence rates of behavioral problems in urban conditions of low-income families [27, 28]. Previous work of the SPLASHY research group revealed differences in health behavior between two socio-cultural areas of Switzerland. Children in the French speaking part showed lower levels of physical activity and more sedentary behavior than in the German speaking part of Switzerland [29]. These socio-cultural differences might not only be found in terms of physical health and health behavior but further in mental health conditions too, as other studies have previously reported different prevalence rates of behavioral problems within a larger culturally similar area with different languages and accordingly different socio-cultural backgrounds [13, 14, 15].

From a psychological point of view, parent-child interactions influence the parental rating of children's behavioral problems. Parents who experience more conflicts in their relationship with their child tend to rate their child as more difficult and more problematic [30]. These conflicting parent-child experiences often interact with the parenting style [31, 32]. Previous studies found a link between negative parenting styles (e.g. inconsistent parenting, poor monitoring, corporal punishment or powerful implementation) and behavioral problems in children [2, 35, 36, 37]. This relation has recently been confirmed in a systematic review of 19 empirical studies where negative parenting style was related to a higher occurrence of internalizing problems in children up to the age of 12 years [38] and was also observed for externalizing

behavioral problems in children aged 4–7 years [5, 39]. In contrast, positive parenting (e.g. high levels of warmth and support) is likely to be related to fewer problem behaviors of the child (e.g. emotional problems or peer problems) [30]. To our knowledge to what extent the influence of parenting style on behavioral problems persists over time within the preschool age has not been investigated so far.

To sum up, prevalence rates of behavioral problems within early childhood have been investigated only in a few studies and vary among countries even when using the same assessment tool. Consequently, data on prevalence rates cannot uniquely be transferred. Additionally, there are only few studies providing evidence about temporal fluctuation or persistence of behavior problems within children and there is no such data in Switzerland for the preschool period. Thus, this study aimed to examine prevalence rates of behavioral problems, for the first time their persistence and predictors of behavioral problems in a Swiss community-based cohort of children during the time span of one year of preschool age, which represents a period of rapid emotional and cognitive development in children [33, 34]. Our first aim was to assess prevalence rates of behavioral problems in preschoolers by parental assessment in Switzerland and to determine their persistence in children over a 12-months period of preschool age. According to Goodman [12] and Gustafsson, Proczkowska-Björklund & Gustafsson [14] we distinguished between clinically relevant and non-relevant behavioral problems and investigated persistence and changes of clinically relevant to non-relevant behavioral problems and vice versa. We hypothesized that prevalence rates of behavioral problems in Swiss children are comparable to those of other European countries and that they persist over a short time period of one year. Our second aim was to examine the influence of child-related factors and parental style on behavioral problems both at the beginning and at the end of the 1-year period. Based on the above presented data, we expected more behavioral problems in children living in low SES families, in rural rather than urban environments, in the French rather than the German speaking part of Switzerland and in families, where parents exert a negative parenting style.

Material and method

Study Design

The Swiss Preschoolers` Health Study (SPLASHY) is a multi-site prospective cohort study including 555 children during early childhood within two sociocultural areas of Switzerland (German and French speaking part, ISRCTN41045021) [40]. Children were recruited from 84 child care centers within five cantons of Switzerland (Aargau, Bern, Fribourg, Vaud, Zurich) which together made up 50% of the Swiss population in 2013 [41]. Recruitment started in November 2013 and ended in November 2015. The detailed study design and the overall objectives have been previously described [40]. The study was approved by all local ethical committees (No 338/13 for the Ethical Committee of the Canton of Vaud as the main ethical committee) and is in accordance with the Declaration of Helsinki. Parents provided written informed consent. In 2014, 476 children participated of which 382 children participated again in the 1-year-follow-up (20% drop out) and 79 new children were tested for baseline (total 555 children). The same study team conducted data collection in baseline and follow-up, in parallel at all study sites. The current analyses include cross-sectional data of the baseline period (wave 2014) and one year later (wave 2015).

Participants

A total of 555 participants were recruited for this study. Of the total sample, parents of 511 children completed baseline and parents of 334 children completed follow-up questionnaires on behavioral problems and parenting style. Questionnaire data were incomplete for hyperactivity/inattention at baseline in one child (n=510 for this subscale) and for parenting style at follow-up in two children (n=332 for parenting subscales).

Assessment

Behavioral problems

Parents rated the behavioral problems of their children by the Strengths and Difficulties Questionnaire (SDQ) [42]. In 2014 and 2015 the SDQ 2-4-years which was developed for children at preschool age was used. Further, in 2015 the SDQ 4-18-years was included for children who were 6 years and above. The two versions differ in the wording of three items. These items are altered as follows: from „thinks things out before acting“ (2-4 years version) to „can stop and think things out before acting“ (4-17 years version), represents the child's hyperactivity problems; from "often argumentative with adults" (2-4 years version) to "often lies or cheats" (4-17 years version) and from "can be spiteful to others" (2-4 years version) to "steals from home, school or elsewhere", both representing conduct problems (4-17 years version). The SDQ consists of four problem-related subscales and one scale assessing prosocial behavior. Only problem-related scales representing psychopathological symptoms were considered for the analyses. The four problem-related subscales encompass ***emotional problems*** ("being nervous or clingy in new situations")***, conduct problems*** ("often having temper tantrums or hot tempers")***, hyperactivity/inattention*** ("constantly fidgeting or squirming") *and* ***peer problems*** ("being picked on or bullied")**.** Each of the 20 items was rated on a 3-point Likert-scale with codes 0 (not true), 1 (somewhat true), and 2 (certainly true) [42]. The four problem scales were then summed up to form one total problem score (***total difficulties***). Reliability scores were lower, but still adequate in comparison to the literature (α = .56 – .82) [43]. Internal consistency was .71 for emotional problems, .73 for conduct problems, .79 for hyperactivity/inattention, .66 for peer problems, and .71 for the total difficulties score. The cut-off values were defined by 90th percentiles of the sample at baseline. Cases of clinical relevance were defined by values above the 90th percentile in line with Goodman [12] and Gustafsson and colleagues [14]. The 90th percentile cut-off of *total difficulties* scale was 15, of *emotional problems* 4, of *conduct problems* 5, of *hyperactivity*

problems 6, and of *peer problems* 3.

Correlates of behavioral problems

Socioeconomic status (SES) was assessed by the current occupational status of both parents using the International Socio-Economic Index (ISEI) [44] and calculating the highest ISEI of mother and father. In addition, we determined the **migration status** of both parents using the two following levels: "both parents Swiss" and "at least one parent non-Swiss". Note that the overlap between SES and migration status was low, i.e. migration status accounted for only 3% of the variance in ISEI (based on t-test for independent samples).

Socio-cultural areas are represented by the two language areas 'German and French' in Switzerland.

The **rural and urban location of childcare** was coded according to the postal code of cities and villages with cities of more than 50'000 inhabitants coded as urban and with less inhabitants as rural according to the Organisation for Economic Co-operation and Development OECD [45].

Parenting style was assessed by the Alabama Parenting Questionnaire (APQ) [37]. The APQ includes seven subscales describing parenting behavior such as ***positive parenting*** (e.g. "You`re talking friendly to your child."), ***responsible parenting*** ("You explain to your child how to behave in a certain situation."), ***powerful implementation*** ("If your child negotiates with you, you`re giving clear instructions."), ***inconsistent parenting*** ("You threaten your child with a punishment, but then you don`t punish him/her."), ***parental involvement*** ("You play with your child or do something funny with him/her."), ***corporal punishment*** ("You hold your child firmly or shake him/her, if he/she did something wrong.") and ***poor monitoring*** ("In the evening, your child stays away longer than he/she should."). The reliability scores were adequate

according to the literature (α = .60 and α = .84) [37]. Alpha values for the subscales were .85 for positive parenting, .71 for responsible parenting, .73 for powerful implementation, .73 for inconsistent parenting, .73 for parental involvement, .70 for corporal punishment, and .78 for poor monitoring.

Statistical analyses

Statistical analyses were conducted using SPSS (IBM, SPSS; Version 23.0, Chicago, IL, USA) and R (R Core Team, 2014). To analyze prevalence rates of behavioral problems during baseline and at 1-year follow-up, we used descriptive statistics, reporting mean ± SD for continuous variables and frequencies and percentages for categorical variables, unless stated otherwise. SDQ-subscales were divided into two groups using 90th percentile cut-off values that differentiate between clinically relevant and non-relevant behavioral problems [14]. To analyze persistence of clinically relevant behavioral problems over both time points, we used cross tabulation.

A random intercept model was set up with the total scale of behavioral problems as continuous outcome and child-related characteristics (age, sex, SES, socio-cultural area, migration status, childcare location) and parenting style (different subscales) as predictors. Childcare center thereby denoted the random intercept. This model was run twice, for baseline and for the 1-year follow-up data. Multiple imputation based on chained equations was used to account for missing data in both models [46]. Twenty-three variables were used in the imputation model, seven covering information on socio-economical/cultural area and childcare background, the remaining sixteen referring to items of the two APQ and SDQ questionnaires. As the results based on the imputed data were comparable to those obtained from a completer analysis, the latter are not presented (but are available by the authors upon request). The Type I error rate caused by the testing of several predictors per outcome was corrected using the Bonferroni-Holm method

[47]. Therefore, considering the total of 12 analyses performed (all tested correlates, including age and sex), the significance level alpha was set to $p<0.004$.

Results

Sample characteristics

Descriptive statistics of the data are presented in Table 1. In 2014 mean age of children was 3.86 years and 52.8% of the children were boys, which represents national gender distribution well [48]. About two thirds of the children lived in the German speaking part, 59.6% in rural areas of Switzerland, which is comparable to the mean Swiss percentage of 53% [49], 58.7% had one or both parents being migrants. Twenty-five percent of all inhabitants in Switzerland are foreigners. The proportion of children with migrant parents in our sample was therefore higher than in the Swiss population [48]. Mean values of parenting and of behavioral problems were in the normal range [37, 43].

Please insert Table 1 here.

Prevalence and persistence of clinically-relevant behavioral problems over one year

Regarding *total scores* of behavioral problems, 6.9 % of the children were above the cut-off at baseline and 6.8 % at one-year follow-up, respectively, while only 3.0% showed persistence of clinically relevant behavior problems across both years (see table 2). For *emotional problems*, the corresponding prevalence rates were 4.3% at baseline, 8.9% one year later, with 1.8% persisting. For *conduct problems*, prevalence rates were 7.6% at baseline, 7.4% one year later, with 2.4% persisting. Further for *hyperactivity*, prevalence rates were 6.2% at baseline, 5.3% one year later, with 2.1% persisting. Finally, for *peer problems* prevalence rates were 8.2% at baseline, 7.4% one year later, with 3.0% persisting. Therefore, the proportion of children who

changed their status from below to above the clinical cut-off for behavioral problems or vice versa between the two years was always higher than the proportion of children lying consistently above the cut-point.

Please insert Table 2 here.

Predictors of behavioral problems

All tested predictors of total scores of behavioral problems at baseline and follow-up are shown in Table 3 and 4. Low SES was associated with higher total scores of behavioral problems in preschoolers both at baseline and one year later. There were no other child-related characteristics predicting behavioral problems. Regarding parenting style, high levels of inconsistent parenting were associated with higher total scores of behavioral problems at both assessment time points, whereas high levels of corporal punishment were only associated with higher total scores of behavioral problems at baseline, but not one year later.

Please insert Table 3 here.

Please insert Table 4 here.

Discussion

Behavioral problems in Swiss children at preschool age

In this study we aimed to assess prevalence rates of behavioral problems including their persistence across a one-year study period in a population-based sample of Swiss preschool children. We also looked at child-related and parent-related factors as potential predictors of behavioral problems. In our sample of 2- to 7-year-old preschoolers, 6.8 % revealed behavioral problems

at baseline. These prevalence rates were similar at the end of the assessment period after one year (6.9%). Referring to subscales, prevalence rates of *emotional problems* increased from 4.3 to 8.9%, while prevalence of other subscales were comparable during this 1-year preschool period. Highest fluctuations in the occurrence of behavioral problems across the one year's study period were found for *emotional problems*, with 7.3% of the children showing no emotional problems in the first wave, but not *at the second wave*, and 3.4% of the children showing emotional problems in the first wave but not *at the second wave*. Only 1.8% of the children showed *emotional problems at both waves*, compared to 2.8% for *conduct problems*, 4.3% for *hyperactivity problems* and 3.0% for both *peer problems* and the *total scale*. These findings cannot easily be compared to other studies, as our literature search revealed no comparable data on persistence of clinically relevant symptoms in children over such a short time period within preschool age. Other studies focused on general prevalence rates, but not specifically on persistence and fluctuations of symptoms across a particular time period, or they considered far larger time periods including preschool age, middle childhood and adolescence. We believe that such changes in emotional problems are most likely reflecting reactions to normative or specially demanding development tasks at that time point [50].

Comparisons of prevalence rates of children with increased total scores of behavioral problems with other studies are limited as these studies either used different SDQ versions or different age ranges [16], applied a teacher version [14] or combined results of parent and teacher versions [13]. However, prevalence rates in our sample were similar to those found in a Norwegian community cohort (n=815, age range 1–5 years) and in a German sample (n=391, age range 3-6 years), obtaining prevalence rates of 7.1% and 7.4%, respectively [14, 15, 16]. These prevalence rates were higher than the 4.8% found in the Copenhagen Child Cohort 2000, which integrated parental and teacher assessment [13].

Comparison of the subscales of behavioral problems between our sample of Swiss children and the sample of Norwegian children (N=815), where a teacher version of the SDQ and

also a 90th percentile cut-off was applied, revealed higher mean prevalence rates of 8.2 to 10.4% in the Norwegian study [15]. However, calculated cut-off values based on 90th-percentiles in our sample were higher (except for *peer problems*) than the respective cut-off values in the Norwegian cohort. Analyses in our Swiss study were therefore more restrictive than in the Norwegian children, but still close to the proposed cut-off range by Goodman of 11-14 for the *total difficulties* score [12]. By comparing the prevalence rates of specific behavioral problems with German data, our Swiss sample revealed similar or lower values than in the German BELLA preschool study, where the CBCL (Child Behavior Checklist) was applied [51]. The BELLA study reported similar prevalence rates for *emotional problems* of 4.2% in their sample of 391 children aged 3–6 years, but higher levels for *hyperactivity problems* (11.8%) and for *psychosocial problems* (12.9%) [16]. These discrepancies might be explained by methodological constraints through the use of different assessment tools or also by possible differences in the operationalization of socio-economic and migrant status in both samples. However, the Danish study (n=5898) containing children aged 5–7 years obtained clearly lower prevalence rates compared to our study with values of 1.5% for *emotional problems*, 0.7% for *hyperactivity problems*, and 3% for *conduct problems,* using the same SDQ assessment but including parental and teacher SDQ ratings [13]. These differences in the results among the different studies may point to a potential benefit of a multi-informant approach that may improve the rating of clinically relevant behavioral problems of young children, especially regarding parents' ratings of *hyperactivity* and *conduct problems*.

Correlates of behavioral problems

Of all tested predictors, low socio-economic status and inconsistent parenting were those found to be associated with behavioral problems in both years. Low socio-economic status predicted high levels of behavioral problems which is in line with previous studies on behavioral

problems [9, 20, 21, 22, 23]. A one unit increase in SES was associated with a 0.05 (2014) and 0.06 (2015) decrease in total scale of behavior problems. As the total scale ranges from 0 to 40, this refers to a relative decrease of 0.13% and 0.15% respectively, which seems rather low. Low socio-economic status is known to be a risk factor for mental and physical health problems, such as behavioral or mental health problems or diabetes up to the risk for early death. These findings highlight the importance of early prevention or intervention programs specifically targeting families and children in this group [9, 22, 25]. Further, high levels of inconsistent parenting were related to high levels of behavioral problems which can be described as a volatile behavior, where parents frequently punish and reward depending on their mood state or external factors, instead of relying on stable values such as emotional warmth, encouragement and flexible rule setting [37]. Change in behavior problems due to inconsistent parenting was more pronounced than those for SES. For a one unit increase in inconsistent parenting scores, total problem score increased by 1.60 in 2014 and by 1.69 in 2015. Note that a one unit increase in inconsistent parenting, refers to a transition from one category to the next higher one (e.g. from "almost never" to "sometimes"). Finally, corporal punishment (defined as aggressive behavior against children [37]) was found to be associated to higher levels of behavioral problems in 2014 but not one year later. Thus in 2014, for a one unit increase in corporal punishment, behavioral problems increased by 1.55. As for inconsistent parenting, a one unit increase in corporal punishment corresponded to a transition from one category to the next higher one. The inconsistent pattern for the association between corporal punishment and behavioral problems across the two years might be due to the generally low prevalence rates of corporal punishment in our sample. Only 0.6% of parents reported regular use of corporal punishment in 2014 and even less (0.2%) in 2015. Negative parenting styles (corporal punishment, inconsistent, permissive and authoritarian parenting) have been related to behavioral problems in previous studies of 4 to 12-year-old children in other countries [39, 40, 52, 53, 54]. The relationship between parenting style and behavioral problems of children can be explained by the social learning

theory of Bandura [55]. Children learn through the observation of their parents [56]. By modeling their parents' behavior they may develop more or less conduct and emotional problems [56] as parental models might influence the child's efficient self –, emotion – and impulse - regulation capacities when facing adverse events might be lacking [40]. Although the socio-cultural background was expected to impact on the parental rating of children's behavioral problems (see results from several Scandinavian studies [13, 14, 15]), we found no differences between German and French speaking part of Switzerland in our study. We hypothesize that in a small country such as Switzerland, sociocultural background, norms and concepts of behavioral problems are consistent and due to similarities of economic, health service and general living conditions prevalence rates of behavioral problems do not differ between both socio-cultural areas.

When interpreting our results, several limitations need to be considered. Changes in prevalence rates from one year to the next may reflect large changes in SDQ scores of a child, but also small (and possibly negligible) changes, if these values are close to the cut-off point. Further, to what extent support of child health services might have influenced changes in prevalence rates of behavioral problems within the assessment period is not clear. Internal consistency of the subscale 'peer problems' was borderline but comparable to the literature, and therefore results related to peer problems need to be interpreted with caution. Reliability in the assessment of behavioral problems is generally limited as differences between parent-rated and self-rated occurrence of behavioral problems have been found in 7-year-old children [9] and might exist already at preschool age. Other potentially more reliable data regarding behavioral problems, for instance by direct assessment of children and teachers' reports of children might be conceivable. However, such data are generally difficult to obtain before entry into a mandatory education system such as kindergarten in Switzerland. In addition, most of the studies rely on reports of mothers only [57], whereas the reports of fathers that could confirm or contradict behavioral problems of their child are often missing and, in our study, had

to be neglected due to the low participation probability of fathers. Other factors such as parental ethnicity might have influenced parental ratings of behavioral problems [58]. Thus, in 59% of all families at least one parent had migrant status (i.e born outside of Switzerland). Though in our analyses we checked the role of migrant status, but there was no association with behavioural problems in young children. Future studies should involve both parents in the assessment of behavioral problems and of variables related to the cultural background as this might better represent the child's behavior in the family context. Additionally, assessment of current parental mental health condition [9] should be considered when analyzing parental ratings of child's behavior, as this has been shown to increase the risk to develop behavioral problems in German children at aged of 3–17 years [9]. This is of special relevance, as the level of parental health might influence the perception of the child's behavior and thus influence their rating of the child's behavioral problems.

Summary

To sum up, almost 7% of the Swiss preschool sample showed clinically relevant behavioral problems on the *total* SDQ scale and this prevalence did not change over a 12-month period. *Emotional problems* was the subscale of behavioral problems which exhibited the strongest change in prevalence over a 12-month period, probably reflecting the subject burden of the child's normative development and the family's coping with daily stressors. Only 1.8–3% of children showed persistent occurrence of behavioral problems over a 12-month period. Low SES and inconsistent parenting style were shown to predict the occurrence of behavioral problems across the 12-month period, while this was not the case for age, gender, or socio-cultural background. Future attempts to assess the impact of parental mental health, SES and parenting style on children's long-term development of behavioral problems could foster psychological

interventions to reduce stress levels of families. Changes of parental stress could improve parent-child interactions and therefore reduce behavioral problems in children of this age.

Acknowledgements and Funding

We would like to thank all children, families and day care centers that contributed data to SPLASHY. We also thank all students and the research team for their valuable contribution. The study was funded by a Sinergia grant from the SNF (Grant Number: CRSII3_147673) (http://p3.snf.ch/project-147673) and by the Jacobs Foundation.

Authors' contributions

The overall study was designed and performed by SK, OJ, JP and SM. All authors conducted this research project and contributed to the data collection. AM assisted in statistical analyses. KS drafted and NM and SM revised the first version of the manuscript. All co-authors elaborated and commented on the manuscript. All authors approved the final version of the manuscript. The last 4 authors have a shared last authorship.

Competing interests

The authors declare that they have no competing interests.

References

1. Egger HL, Angold A (2006) Common emotional and behavioral disorders in preschool children: presentation, nosology, and epidemiology. J Child Psychol Psychiatry 47(3-4): 313-337

2. Bayer JK, Hastings PD, Sanson AV, Ukoumunne OC, Rubin KH (2010) Predicting mid-childhood internalising symptoms: a longitudinal community study. IntJMent Health Promot 12(1): 5-17

3. Bosquet M, Egeland B (2006) The development and maintenance of anxiety symptoms from infancy through adolescence in a longitudinal sample. Dev Psychopathol 18(2): 517-550

4. Tram JM, Cole DA (2006) A multimethod examination of the stability of depressive symptoms in childhood and adolescence. J Abnorm Psychol 115(4): 674

5. Weeks M, Ploubidis GB, Cairney J, Wild TC, Naicker K, Colman I (2016) Developmental pathways linking childhood and adolescent internalizing, externalizing, academic competence, and adolescent depression. J Adolesc 51: 30-40

6. Reef J, Diamantopoulou S, van Meurs I, Verhulst FC, van der Ende J (2011) Developmental trajectories of child to adolescent externalizing behavior and adult DSM-IV disorder: results of a 24-year longitudinal study. Soc Psychiatry Psychiatr Epidemiol 46(12): 1233-1241

7. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE (2005) Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry 62(6): 593-602

8. Briggs-Gowan MJ, Carter AS, Bosson-Heenan J, Guyer AE, Horwitz SM (2006) Are infant-toddler social-emotional and behavioral problems transient? J Am Acad Child Adolesc Psychiatry 45(7): 849-858

9. Klasen F, Meyrose AK, Otto C, Reiss F, Ravens-Sieberer U (2017) Psychische Auffälligkeiten von Kindern und Jugendlichen in Deutschland. Monatsschr Kinderh 165(5): 402-407

10. Mesman J, Koot HM (2001) Early preschool predictors of preadolescent internalizing and externalizing DSM-IV diagnoses. J Am Acad Child Adolesc Psychiatry 40(9): 1029-1036

11. Slemming K, Sørensen MJ, Thomsen PH, Obel CH, Tine, Linnet KM (2010) The association between preschool behavioural problems and internalizing difficulties at age 10–12 years. Eur Child Adolesc Psychiatry 19(10): 787-795

12. Goodman R (1997) The Strengths and Difficulties Questionnaire: a research note. J Child Psychol Psychiatry 38: 581-586

13. Elberling H, Linneberg A, Olsen EM, Goodman R, Skovgaard AM (2010) The prevalence of SDQ-measured mental health problems at age 5-7 years and identification of predictors from birth to preschool age in a Danish birth cohort: the Copenhagen Child Cohort 2000. Eur Child Adolesc Psychiatry 19(9): 725-735

14. Gustafsson BM, Proczkowska-Bjorklund M, Gustafsson PA (2017) Emotional and behavioural problems in Swedish preschool children rated by preschool teachers with the Strengths and Difficulties Questionnaire (SDQ). BMC Pediatr 17(1): 110

15. Wichstrom L, Berg-Nielsen TS, Angold A, Egger HL, Solheim E, Sveen TH (2012) Prevalence of psychiatric disorders in preschoolers. J Child Psychol Psychiatry 53(6): 695-705

16. Wlodarczyk O, Pawils S, Metzner F, Kriston L, Wendt C, Klasen F et al. (2016) Mental health problems among preschoolers in Germany: Results of the BELLA preschool study. Child Psychiatry Hum Dev 47(4): 529-538

17. Steinhausen HC, Metzke C, Winkler, Meier, Kannenberg R (1998) Prevalence of child and adolescent psychiatric disorders: the Zürich Epidemiological Study. Acta Psychiatr Scand 98(4): 262-271

18. Croft S, Stride C, Maughan B, Rowe R (2015) Validity of the strengths and difficulties questionnaire in preschool-aged children. Pediatrics 135(5): e1210-1219

19. Stone LL, Janssens JM, Vermulst AA, Van Der Maten M, Engels RC, Otten R (2015) The Strengths and Difficulties Questionnaire: psychometric properties of the parent and teacher version in children aged 4-7. BMC Psychol 3(1): 4

20. Hölling H, Schlack R, Petermann F, Ravens-Sieberer U, Mauz E (2014) Psychische Auffälligkeiten und psychosoziale Beeinträchtigungen bei Kindern und Jugendlichen im Alter von 3 bis 17 Jahren in Deutschland – Prävalenz und zeitliche Trends zu 2 Erhebungszeitpunkten (2003–2006 und 2009–2012). Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz 57(7): 807-819

21. Eschmann S, Häner Y, Weber, Steinhausen HC (2007) Die Prävalenz psychischer Störungen bei Kindern und Jugendlichen unter Berücksichtigung soziodemografischer Merkmale. Z Klin Psychol Psychother 36(4): 270-279

22. Lampert T, Kurth BM (2007) Sozialer Status und Gesundheit von Kindern und Jugendlichen. Dtsch Arztebl Int 104 (43): A2944-A2949

23. Rajmil L, Herdman M, Ravens-Sieberer U, Erhart M, Alonso J (2014) Socioeconomic inequalities in mental health and health-related quality of life (HRQOL) in children and adolescents from 11 European countries. Int J Public Health 59(1): 95-105

24. Davis E, Sawyer MG, Lo SK, Priest N, Wake M (2010) Socioeconomic risk factors for mental health problems in 4–5-year-old children: Australian population study. Acad Pediatr 10(1): 41-47

25. Park H, Walton-Moss B (2012) Parenting style, parenting stress, and children's health-related behaviors. J Dev Behav Pediatr 33(6): 495-503

26. Morcillo C, Ramos-Olazagasti MA, Blanco C, Sala R, Canino G, Bird H, Duarte CS (2015) Socio-cultural context and bulling others in childhood. J Child Fam Stud 24(8): 2241-2249

27. Black MM, Krishnakumar A (1998) Children in low-income, urban settings: interventions to promote mental health and well-being. Am Psychol 53(6): 635

28. Larsson B, Frisk M (1999) Social competence and emotional/behaviour problems in 6–16 year-old Swedish school children. Eur Child Adolesc Psychiatry 8(1): 24-33

29. Leeger-Aschmann CS, Schmutz EA, Radtke T, Kakebeeke TH, Zysset AE, Messerli-Bürgy N et al. (2016) Regional sociocultural differences as important correlate of physical activity and sedentary behaviour in Swiss preschool children. Swiss Med Wkly 146: w14377

30. Denham SA, Mitchell-Copeland J, Strandberg K, Auerbach S, Blair K (1997) Parental contributions to preschoolers' emotional competence: Direct and indirect effects. Motiv Emot 21: 65-86

31. Climie EA, Mitchell K (2017) Parent-child relationship and behavior problems in children with ADHD. Int J Dev Disabil 63(1): 27-35

32. Rubin KH, Mills RS (1991) Conceptualizing developmental pathways to internalizing disorders in childhood. Can J Behav Sci 23(3): 300

33. Blair C (2006) How similar are fluid cognition and general intelligence? A developmental neuroscience perspective on fluid cognition as an aspect of human cognitive ability. Behav Brain Sci 29(2): 109-125

34. Diamond A, Barnett WS, Thomas J, Munro S (2007) Preschool program improves cognitive control. Science 318(5855): 1387-1388

35. Calkins SD, Blandon AY, Williford AP, Keene SP (2007) Biological, behavioural and relational levels of resilience in the context of risk for early childhood behaviour problems. Dev Psychopathol 19: 675-700

36. Feng X, Shaw DS, Silk JS (2008) Developmental Trajectories of Anxiety Symptoms Among Boys Across Early and Middle Childhood. J Abnorm Psychol 117(1): 32–47

37. Reichle B, Franiek S (2009) Erziehungsstil aus Elternsicht: Deutsche erweiterte version des Alabama Parenting Questionnaire für Grundschulkinder (DEAPQ-EL-GS). Z Entwicklungspsychol Padagog Psychol 41(1): 12-25

38. Rose J, Roman N, Mwaba K, Ismail K (2017) The relationship between parenting and internalizing behaviours of children: a systematic review. Early Child Dev Care 1-19

39. Williams LR, Degnan KA, Perez-Edgar KE., Henderson HA, Rubin KH, Pine D et al. (2009) Impact of behavioral inhibition and parenting style on internalizing and externalizing problems from early childhood through adolescence. J Abnorm Psychol 37(8): 1063-1075

40. Messerli-Bürgy N, Kakebeeke TH, Arhab A, Stülb K, Zysset AE, Leeger-Aschmann CS et al. (2016) The Swiss Preschoolers' health study (SPLASHY): objectives and design of a prospective multi-site cohort study assessing psychological and physiological health in young children. BMC Pediatr 16: 85

41. Statistik Bf. Bevölkerungsstand und -struktur – Indikatoren, retrieved from: http://www.bfs.admin.ch/bfs/portal/de/index/themen/01/02/blank/key/raeumliche_verteilung/kantone__gemeinden.html. 2012. Accessed 7 July 2015.

42. Goodman R (2001) Psychometric properties of the Strengths and Difficulties Questionnaire. J Am Acad Child Adolesc Psychiatry 40(11): 1337-1345

43. Woerner W, Becker A, Friedrich C, Rothenberger A, Klasen H, Goodman R (2002) Normierung und Evaluation der deutschen Elternversion des Strengths and Difficulties Questionnaire (SDQ): Ergebnisse einer repräsentativen Felderhebung. Z Kinder Jugendpsychiatr Psychother 30(2): 105-112

44. Ganzeboom HBG (2010) A new International Socio-Economic Index (ISEI) of occupational status for the International Standard Classification of Occupation 2008 (ISCO-08) constructed with data from the ISSP 2002-2007. Paper presented at the Annual Conference of International Social Survey Programme, Lisbon

45. Organisation for Economic Co-operation and Development OECD (2012), Redefining "Urban": A New Way to Measure Metropolitan Areas, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264174108-en

46. Van Buuren S, Groothuis-Oudshoorn K (2011) MICE: Multivariate imputation by chained equations in R. J Stat Softw 45(3): 1-67

47. Holm S (1979) A simple sequentially rejective multiple test procedure. Scand J Stat 6: 65-70

48. Bundesamt für Statistik (2018) Bevölkerung: Panorama. Retrieved from: https://www.bfs.admin.ch/bfs/de/home/statistiken/kataloge-datenbanken/publikationen.assetdetail.4522225.html. Accessed on: 02/08/2018

49. Bundesamt für Statistik (2017) Gemeindetypologie und Stadt/Landtypologie 2012 BFS und aktuell. Retrieved from: https:www.bfs.admin.ch/bfs/de/. Retrieved on: 17/08/2018

50. Holodynski M (2013) The internalization theory of emotions: a cultural historical approach to the development of emotions. MCA 20(1):4-38

51. Wille N, Bettge S, Wittchen HU, Ravens-Sieberer U, BELLA Study Group (2008) How impaired are children and adolescents by mental health problems? Results of the BELLA study. Eur Child Adolesc Psychiatry 17(1):42-51

52. Stormshak EA, Bierman KL, McMahon RJ, Lengua LJ, Conduct Problems Prevention Research Group (2000) Parenting practices and child disruptive behavior problems in early elementary school. J Clin Child Psychol 29(1): 17-29

53. Pinquart M (2017) Associations of parenting dimensions and styles with externalizing problems of children and adolescents: An updated meta-analysis. Dev Psychol 53(5): 873-932

54. Sangawi H, Adams J, Reissland N (2015) The effects of parenting styles on behavioral problems in primary school children: a cross-cultural review. Asian Soc Sci 11(22): 171-186

55. Bandura A (1971) Social learning theory. New York: General Learning Press

56. Bailey JA, Hill KG, Oesterle S, Hawkins JD (2009) Parenting practices and problem behavior across three generations: Monitoring, harsh discipline, and drug use in the intergenerational transmission of externalizing behavior. Dev Psychol 45(5): 1214-1226

57. Chiorri C, Hall J, Casely-Hayford J, Malmberg LE (2016) Evaluating measurement invariance between parents using the Strengths and Difficulties Questionnaire (SDQ). Assessment 23(1): 63-74

58. D'Souza S, Waldie KE, Peterson ER, Underwood L, Morton SMB (2017) Psychometric properties and normative data for the preschool Strengths and Difficulties Questionnaire in two-year-old children. J Abnorm Psychol 45(2): 345-357